SHORTER ARTICLES AND DISCUSSION

EUROPEAN FOSSIL FISH-SCALES

In European Cretaceous deposits fish-scales have been found at various times, and occasionally have been named and described by paleontologists. Dr. A. S. Woodward, in his great "Catalogue of the Fossil Fishes," has carefully and accurately listed all the names so given, but has made little or no attempt to examine the records critically, assuming that they were valueless, or nearly so. More recent work on fish-scales brings out the fact that these materials are of great value for the understanding of Mesozoic fish life, but unfortunately they have been described with little knowledge of their significant characters. An important pioneer work was that of Geinitz,[1] describing scales from the Turonian of Saxony. Geinitz realized that it was necessary to make comparisons with scales of recent fishes, and gave a plate of "Schuppen von lebenden Fischen," but unfortunately chose species which had little relationship, for the most part, with the fossils studied. The three plates of fossil scales appear to have been very carefully drawn, and from them it is possible to gather a number of facts not brought out in the text. *Cyclolepis agassizi* appears to be Salmonoid, agreeing quite well with the modern *Salmo*. *Aspidolepis steinlai* is like the scales of living Stromateidæ, as *Poronotus*. *Osmeroides divaricatus* evidently has nothing to do with the genus to which it is assigned, but is of characteristic Albulid type. *Osmeroides lewesiensis* (Mantell), as determined by Geinitz, consists in the main of scales agreeing with those of the remarkable living genus *Pterothrissus*. The genus *Cladocyclus* presents some serious difficulties. The type is a Brazilian species (*C. gardneri* Agassiz) from the Upper Cretaceous of the Province of Ceará. I am indebted to Dr. D. S. Jordan for material referred to this species, and it appears that the large scales have extremely fine circuli, while those of the lateral line possess branching canals of the same general type as those of the living S. American genus *Hydrolycus*.[2] It does not

[1] "Die Fossilen Fischschuppen aus dem Plänerkalke in Strehlen," 1868.

[2] These canals are in the *apical*, not the basal field, as erroneously stated by me in *Annals Carnegie Museum*, IX, p. 110.

seem certain that this is the true *Cladocyclus* of Agassiz; it may represent a new genus ancestral to the Neotropical Characoid fishes. European "*Cladocyclus*" is in any event surely distinct from the Brazilian. The *C. strehlensis* of Geinitz includes scales approaching those of *Potamalosa,* but the species is founded in the main on an entirely different type, which is evidently close to the English *C. lewesiensis.* It is a question what generic name should be used for the *lewesiensis-strehlensis* type, which must be removed from *Cladocyclus.* It was formerly included in *Hypsodon* Agassiz, but that generic name appears to belong properly to the fishes usually called *Portheus,* the type being *lewesiensis* Mantell = *mantelli* Newton. The name *lewesiensis* also belongs strictly to the *Portheus,* and the English so-called *Cladocyclus,* if distinct from the Geinitz species, seems to need a new name. These matters will be taken up more fully elsewhere at a later date. *Beryx ornatus* of Geinitz, properly called *Hoplopteryx lewesiensis* (Mantell), appears to be a primitive Berycoid type, having scales such as might be expected in an ancestor of the modern Berycidæ. *Hemilampronites steinlai* Geinitz consists of scales differing little from the living *Hyporhamphus.* The scales figured by Geinitz as those of *Macropoma mantelli* Agassiz[3] have no resemblance to that species; from the fine transverse circuli, basal radii, and apical teeth like those of *Pomacanthus,* they appear to belong to some Teleost more or less related to the Berycoids. Thus we find that although Geinitz knew little about the affinities of his scales, they had excellent characters, reminding us in certain cases of modern genera, and indicating the great antiquity and constancy of peculiarities of scale structure. In 1878 Anton Fritsch[4] undertook to describe the fish-scales of the Upper Cretaceous of Bohemia, and believed that he had a number of the species of Geinitz. His *Cladocyclus strehlensis* and *Cyclolepis agassizi* are perhaps correct, but the others are evidently different from the Geinitzian forms. His *Macropoma speciosum* Reuss is a genuine species of that genus, with quite characteristic scales. His *Macropoma forte,* on the other hand, appears to be a *Cœlacanthus.* His *Osmeroides lewesiensis* has regular transverse circuli between the radii, instead of the minute tubercles (markings like the surface of a strawberry) of the Geinitz scales

[3] *Macropoma mantelli* should be called *Macropoma lewesiensis* (Mantell), based on the *Amia(?) lewesiensis* of Mantell.

[4] "Die Reptilien und Fische der böhmischen Kreideformation."

and of *Pterothrissus*. His *O. divaricatus* is wholly distinct from the scale described by Geinitz under that name, and has not the Albulid characters. The *Beryx ornatus* scales are printed upside down, and the artist has added ctenoid structures (small teeth) above, on what is really the basal margin. In 1874 T. C. Winkler published a paper[5] in which he described two species from the scales. His *Osmeroides belgicus* appears to be congeneric with the *Osmeroides lewesiensis* as understood by Fritsch. His *Cycloides incisus*, supposed new genus and species, of which he says that he knows no fish, living or fossil, with such scales, is apparently worthless. It may not be a fish-scale. In America the fossil scales of Teleosts have received very little attention, but a large collection accumulated by the U. S. Geological Survey is now under review, and will undoubtedly yield much of value for the understanding of Mesozoic fishes, and at the same time throw light on the ancestry and relationships of modern families.

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[5] "Mémoire sur quelques restes du Poissons du systéme heersien," *Arch. Mus. Teyler.*, IV.